SILVERLEAF WHITEFLY IN THE SAN JOAQUIN VALLEY - YEAR 4

Larry Godfrey, Charlie Summers, and Peter Goodell
Department of Entomology,
University of California
Davis, CA
Department of Entomology,
University of California
Davis, CA
Kearney Agric. Center
Parlier, CA
Statewide IPM Project,
University of California, Kearney Agric. Center.

Abstract

Silverleaf whitefly populations were first found in the San Joaquin Valley in July 1992. It is now established in the San Joaquin Valley, although losses in cotton have been minimal. This pest is able to successfully overwinter in the valley and utilizes a sequence of crop and weed hosts during the year. In 1993, populations of this pest were found in cotton fields in late July/Aug and densities increased and reached moderate levels in cotton in Sept. However, damage to cotton was minimal. In 1994, silverleaf whitefly populations occurred about 3 weeks earlier than in 1993 and infested cotton fields in June and built to fairly high densities in some fields. Some whitefly-inflicted damage occurred in cotton. Silverleaf whitefly populations in 1995 were at much lower densities than in 1994 and, in many ways, populations were more similar to the 1993 levels. Populations of this pest are apparently sensitive to unfavorable spring environmental conditions (degree-day accumulation and rainfall in the spring), which apparently inhibited build-up in 1995.

Introduction

Field populations of the silverleaf whitefly (SWF), *Bemisia argentifolii* were first found in the San Joaquin Valley (SJV) of California in July/August 1992 (Gruenhagen et al. 1993). This pest caused an estimated $111 million crop loss to fall/winter crops in 1991/92 in the Imperial Valley (Gonzalez et al. 1992). This loss was magnified several times when the effects on the agricultural community (farm workers, agricultural suppliers, etc.) were also considered (Gonzalez et al. 1992). Therefore, the occurrence of the SWF in the southern SJV near Bakersfield was of great concern. The SJV is a region of great crop diversity with large acreage of cotton, alfalfa, and vegetable crops. In addition, in many areas, agricultural crops of some type are grown year-long. This study was designed to evaluate the seasonal dynamics, including host plants, of the SWF in the SJV. Environmental conditions and cropping patterns in the SJV differ significantly from the Imperial Valley, which will influence SWF biology. Winters in the SJV are characterized by cool, wet, foggy conditions. SWF degree-day accumulation in the SJV is reduced compared with the Imperial valley because of a delayed warm-up in the spring and a cooler, earlier fall. This publication is a report on the third year of a three year project to study SWF seasonal dynamics in the SJV.

Materials and Methods

SWF seasonal dynamics and host plant preference were monitored within twelve 36 sq. mi. sample sites in the SJV. These sites were established in May 1993 in Kern, Kings, Tulare, Fresno, and Merced counties. The location of these sites was reported in Godfrey et al. (1995). Sites were chosen that had the high crop diversity representative of general SJV conditions. Bi-weekly sampling of SWF nymphs on all potential host plants continued through December 1995. All potential weed and crop hosts, and a limited number of ornamental plants hosts, were sampled. The sample protocol used was a 10-minute visual search of the leaf undersides with the number of SWF nymphs (primarily third instars) quantified. Sampled nymphs were taken to the laboratory and the whitefly species and viability were verified. Detailed results from 1993 and 1994 were reported by Godfrey et al. (1994) and Godfrey et al. (1995).

Additionally, SWF adults were sampled in 1994 and 1995 with yellow sticky traps (3 x 3 inches) placed in three transects from east to west across the SJV. Transects were south of Bakersfield (southern SJV), in northern Kern county (south-central SJV), and in Tulare/Fresno counties (central SJV). Traps were placed every 1-2 miles and monitored for SWF adults at ~2 weeks intervals. A 24 hour collection period was used. Results from 1994 were reported by (Goodell et al. 1995).

Results and Discussion

Seasonal Dynamics

For review, SWF populations in 1993 were first found in early June and this pest was found in cotton fields in late July/Aug. Populations increased and reached moderate levels in cotton in Sept.; however, damage to cotton was minimal. Some damage did occur to fall crops. In 1994, SWF populations occurred about 3 weeks earlier than in 1993, i.e., early May. SWF infested cotton fields in June and built to fairly high densities in some fields. Some SWF-inflicted damage occurred in cotton and damage to fall crops was more widespread.

SWF populations in 1995 were at much lower densities than in 1994 and, in many ways, populations were more similar to the 1993 levels. Highest densities were found in the two southernmost sample areas (southern/central Kern

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1023-1026 (1996)
National Cotton Council, Memphis TN

County) and in areas on the eastern edge of the SJV. For example, SWF populations in the Arvin/Lamont sample area (central Kern County) were first found on melons on 1 June 1995 compared with 3 May 1994 (Fig. 1). Densities increased to ~500 nymphs per 10-minute search in 1995 compared with ~7500 nymphs per 10-minute search in 1994. Correspondingly, SWF densities on cotton were first found in late July and remained below 1993-94 levels; densities in 1995 peaked at ~150 nymphs per 10-minute search (except for higher densities on cotton regrowth). In the Mettler/Maricopa area (southern Kern County), SWF nymphs were first found on melons and cotton in mid-July 1995 (Fig. 2). Densities peaked in acala cotton on 21 Sept. at ~250 nymphs per 10-minute search period (higher densities were found on cotton regrowth). On pima cotton, SWF infestations were more severe and peaked on 19 Oct. at 2500 nymphs per 10-minute search period. A comparison 1994 and 1995 SWF seasonal dynamics on acala cotton in the Mettler/Maricopa study area is shown in Fig. 3.

The generalized host plant sequence was melons, acala cotton, pima cotton, fall melons, weeds, carrots, lettuce, alfalfa, and citrus in the Mettler/Maricopa area. Tomatoes, peppers, and sugarbeets were also grown in this area, but were not found to be infested in 1995; however, tomatoes and peppers were SWF host plants in 1994. About 10 weed species were commonly infested with *Datura* spp. (tolguacha and jimsonweed), *Abutilon* sp. (velvetleaf), and *Malva* spp. (mallow) having the highest densities. The occurrence of SWF on broadleaf weeds, alfalfa, and carrots during the fall was common to many search areas. Weeds, citrus, and cole crops (in the areas grown) appear to be important overwintering SWF host plants. SWF densities on citrus were low, but consistently occurred during the winter.

Sticky Trap Sampling

Peak occurrence of SWF adults was 15 Sept. in the southern SJV transect, 27 Oct. in the south-central SJV transect, and 11 Nov. in the central SJV transect (Fig. 4). The dates of peak occurrence in 1994 were 16 Sept. (southern SJV transect), 1 Oct. (south-central SJV transect) and 20 Oct. (central SJV transect). Therefore, populations were delayed by 2-3 weeks in 1995 compared with 1994, especially in the northern-most transects, and populations were much lower in 1995 than in 1994 (Fig. 5). During the period of peak flight occurrence in 1995, 95, 79, and 51% of the traps for the southern, south-central, and central SJV transects, respectively, had SWF adults. In 1994, 100% of the traps had some SWF adults for the southern and south-central SJV transects and 74% had SWF adults for the central SJV transect. From these data, SWF adults were not as widely distributed in the SJV in 1995 as in 1994. From our observations, the timing and distribution of SWF adults from the sticky traps appeared to correspond well with SWF population dynamics in nearby fields.

Population densities were generally highest along the southern transect near Bakersfield (Fig. 6) and on the eastern side of the SJV for the other two transects (Fig. 7); however, again densities were lower than in 1994. Populations in 1994 reached nearly 2000 SWF adults per trap per 24 hour period on some traps compared with ~1000 SWF adults per trap per 24 hour period in 1995.

Although the SWF was not a severe problem in cotton pest management in the SJV in 1995, stable long-term management of this pest is needed. Several possible reasons exist to explain why SWF densities were lower in 1995 than in 1994. The spring weather was not conducive to whitefly population development or to the planting of key spring host crops for SWF. Degree-day accumulation (1 March to 30 June) was 15-20% lower in 1995 than in 1994. Precipitation (1 March to 30 June) in 1995 was nearly twice that of 1994 in terms of amount and frequency of occurrence. These environmental conditions also delayed the planting of spring melons in many areas. Secondly, the high incidence of insecticide use in cotton in 1995 for lygus, aphid, and mite controls may have also "controlled" SWF. The use of Provado for lygus bugs and aphids probably exasperated the effect. Finally, the high cotton aphid and spider mite populations in cotton may have inhibited SWF population buildup on this crop. Therefore, considerable work in still needed to design long-term management schemes for this pest.

Conclusions

The SWF is established in the SJV, although losses in cotton have been minimal. This pest is able to successfully overwinter in the SJV and utilizes a sequence of crop and weed hosts during the year. Populations of this pest are apparently sensitive to unfavorable spring environmental conditions. From the initial SWF find in Kern County, low density populations have now been found throughout most of the southern/central SJV.

Acknowledgments

This research was supported in part by grants from Cotton Incorporated State Support and California Cotton Pest Control Board. The technical assistance of several field technicians is greatly appreciated.

References

1. Godfrey, L. D., P. B. Goodell, W. J. Bentley, C. G. Summers, T. Prather, & R. Coviello. 1994. Contribution of crops, weeds, and parasites to the abundance of silverleaf whitefly in San Joaquin Valley cotton. *In* 1994 Proceedings Beltwide Cotton Conference, National Cotton Council, pp. 873-874.

2. Godfrey, L. D., P. B. Goodell, C. G. Summers, W. J. Bentley, & T. Perring. 1995. Seasonal development of

silverleaf whitefly populations in cotton and other crops in the San Joaquin Valley. *In* 1995 Proceedings Beltwide Cotton Conference, National Cotton Council, pp. 831-834.

3. Gonzalez, R. A., G. E. Goldman, E. T. Natwick, H. R. Rosenberg, J. I. Grieshop, S. R. Sutter, T. Funakoshi, and S. Davila-Garcia. 1992. Whitefly invasion in Imperial Valley costs growers, workers millions in losses. Calif. Agric. 46: 7-9.

4. Goodell, P. B., L. D. Godfrey, C. G. Summers, W. J. Bentley, and J. Wood. 1995. Distribution of *Bemisia argentifolii* in the San Joaquin Valley. *In* 1995 Proceedings Beltwide Cotton Conference, National Cotton Council, pp. 834-836.

5. Gruenhagen, N. M., T. M. Perring, L. G. Bezark, D. M. Daoud, & T. F. Leigh. S. 1993. Silverleaf whitefly present in the San Joaquin Valley. Cal. Agric. 47: 4-8.

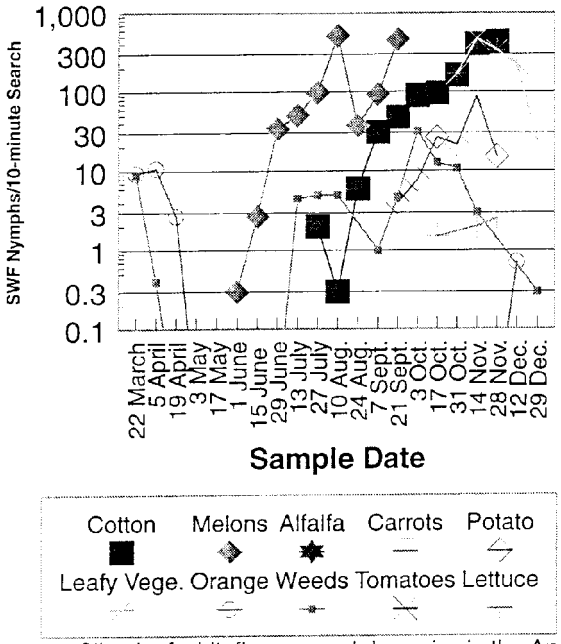

Fig. 1. Silverleaf whitefly seasonal dynamics in the Arvin/ Lamont area - 1995.

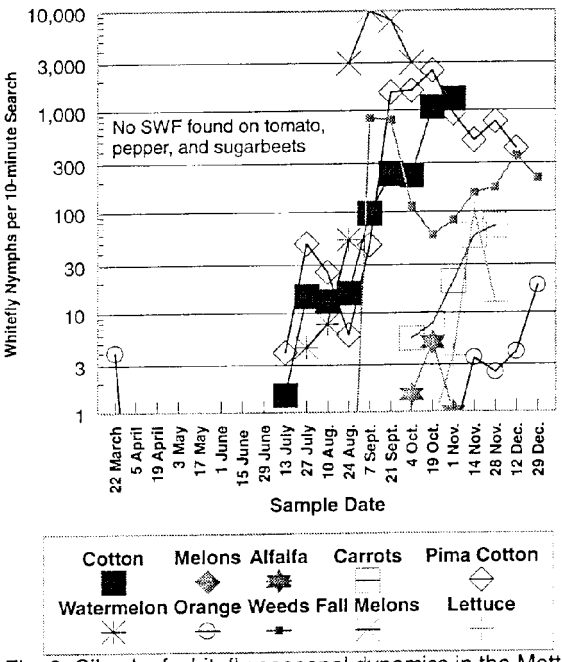

Fig. 2. Silverleaf whitefly seasonal dynamics in the Mettler/ Maricopa area - 1995.

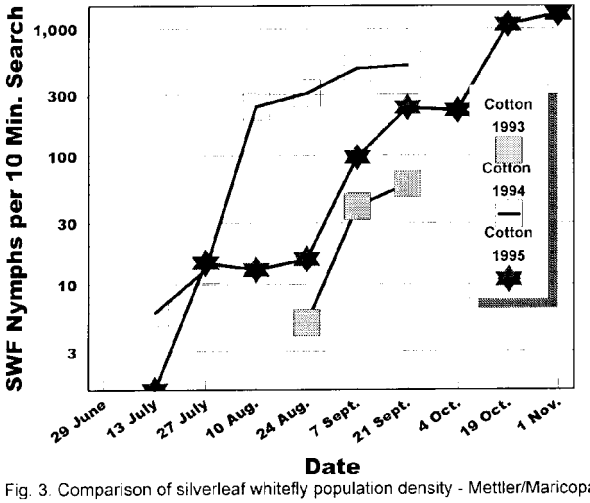

Fig. 3. Comparison of silverleaf whitefly population density - Mettler/Maricopa 1993 - 95.

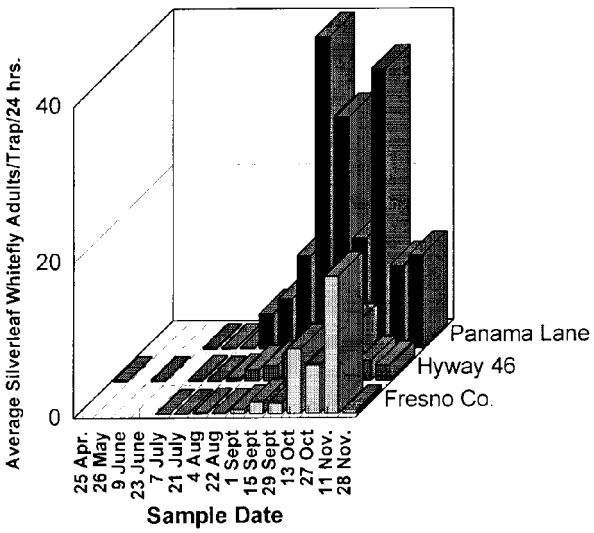

Fig. 4. Comparison of average silverleaf whitefly adult densities from three sticky trap transects in San Joaquin Valley - 1995.

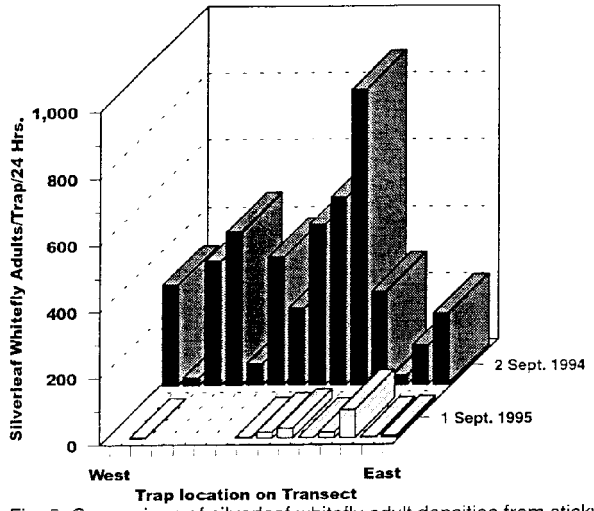

Fig. 5. Comparison of silverleaf whitefly adult densities from sticky trap transect in southern San Joaquin Valley - 1994 and 1995.

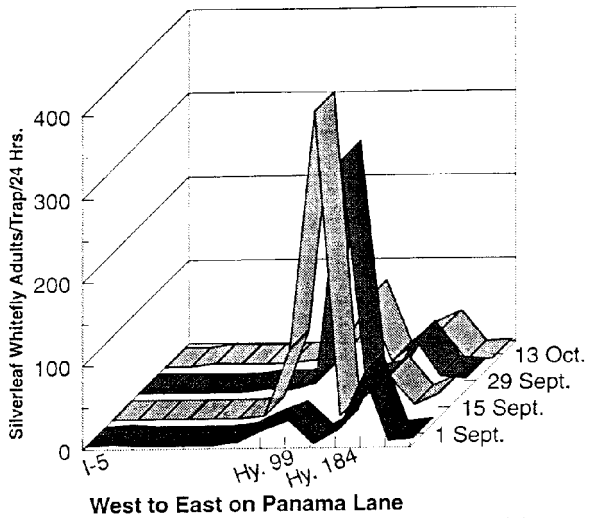

Fig. 6. Distribution of silverleaf whitefly adults on sticky trap transect during peak flight - Panama Lane, 1995.

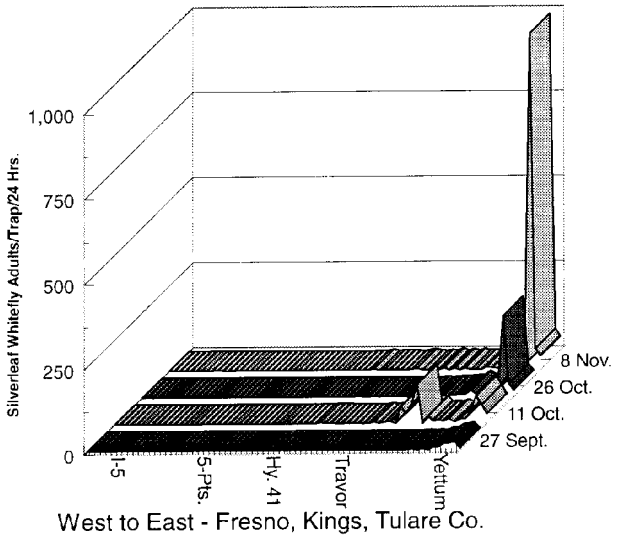

Fig. 7. Distribution of silverleaf whitefly adults on sticky trap transect during peak flight - Fresno Co., 1995.